

cules of a gas and to produce photochemical action. The number of ions produced per unit length along the path of the  $\alpha$  particle has its maximum very near the point where it loses its ionising power. The  $\beta$  particles, however, are almost completely scattered in the first thin layer of matter, and inside it the radiation broadens out in all directions, and any trace of the direction of the impinging rays is soon lost.

In the aurora, according to Birkeland's theory, we are actually examining the luminosity produced when the electric radiation strikes the upper strata of the atmosphere, and from the form and structure of the luminosity we should be able to examine the way in which the solar radiation is absorbed by matter.

One of the most conspicuous forms of aurora are the draperies, of which an illustration is given in the accompanying figure. We notice the straight-lined structure. That the draperies are formed by something coming towards the earth from outside will be evident to all who have witnessed their formation. On March 27, 1910, the writer had the opportunity of examining a most brilliant aurora from the mountains of "Jotunheimen." Brilliant draperies were formed, and they could be seen actually falling down in the direction of the streamers, one bundle adding itself to another in rapid succession so as to form long spirals and bands. Now the structure of the luminosity is just as would be expected if the draperies were formed by a type of rays showing an absorption like that found for the  $\alpha$  rays. Looking at the luminosity along the transverse streamers, we shall always notice that the intensity gradually increases downwards, but stops all of a sudden, just as it is found for the ionisation produced by an  $\alpha$  particle along its path.

I do not mean to say that it is exactly  $\alpha$  rays or charged helium atoms which produce draperies, but I think that the similarity in absorption strongly points to a similarity in type of radiation—in other words, that the rays producing the draperies are of atomic size and carry an electric charge.

The fact that the draperies occur mostly on the evening and night side of the earth should, according to the law of the magnetic deflection, require a negative charge of the rays; but such rays may well be possible, for, as we know, Sir J. J. Thomson has found that accompanying the positive rays in a vacuum tube there are other rays formed by atoms, but carrying a negative charge.

In view of the fact that a number of the same spectral lines are found in the corona and the aurora spectrum, which belong to the rare gases, it would be natural to suppose that these inert gases, e.g. argon, neon, xenon, krypton, helium, and possibly coronium, are forming the carriers of the "electric radiation" producing the draperies.

The existence of such radiation does not in any way exclude the existence of corpuscular rays; these may be the cause of the auroral "arch," which has just the diffuse appearance to be expected from the law of absorption of the  $\beta$  rays. Further, the magnetic disturbances may to a great extent be due to radiation of the  $\beta$ -ray type.

L. VEGARD.

University of Christiania, March 16.

#### The Velocity of Earth Movements caused by the Messina Earthquake.

I AM deeply indebted to Prof. J. Milne, F.R.S., who, in NATURE of March 23, did me the honour of directing the attention of scientific men to my memoir on the velocity of earth movements caused by the Messina earthquake. As the notice contains some remarks on my work which require a little explanation, I beg to be permitted to state my views here.

According to some seismologists, the position of the hypocentre is at the intersection of an asymptote to Schmidt's hodograph, with a vertical ordinate drawn through its apex. It seems to me, therefore, that the absence of any measurable flexure in the curves may really mean that the hypocentre of the Messina earthquake was very shallow. That is, however, a matter of opinion about which seismologists can easily be divided, and I have no desire to insist on this subject.

Prof. Milne assumes that I divided the large-wave phase

of the seismograms into three parts, called  $L_1$ ,  $L_2$ ,  $L_3$ , being  $L_1$  the commencement of maximum motion,  $L_2$  the maximum movement itself, and  $L_3$  the phase which travels the slowest. He adds that if this is to be accepted as a definite and recognisable phase in a seismogram, there seems to be no reason why we should not also accept many other phases, which may be indicated by the letters  $L_4$ ,  $L_5$ ,  $L_6$ , &c. The remark is of interest, but I deserve neither praise nor blame for the division of the large-wave portion of seismological registrations. Prof. Milne well knows that the division of the principal portion of a seismogram into six groups was done by Prof. Omori, analysing the registrations obtained at Tokio, and such a division is now accepted by almost all seismologists. In my memoir,  $L_1$  indicates the commencement of the initial phase;  $L_2$  and  $L_3$  are respectively the commencements of the slow-period and of the quick-period phases of the principal portion of the registrations, according to Prof. Omori's division.

Instead of considering as a whole the large-wave phase, which involves some uncertainty (as often the commencement of the principal portion is assumed to be on Omori's initial phase and at other times the commencement of the same principal portion is referred to the slow-period phase), I tried to distinguish in all seismograms the first three groups of the large-wave phase,  $L_1$ ,  $L_2$ ,  $L_3$ . I am not dissatisfied at having done this, because I have obtained some results which I think are not without importance for physical seismology.

I conclude by expressing my warmest thanks to Prof. Milne for his notice and for the valuable article on the necessity of restoring the Messina Observatory contributed by him to NATURE of February 16.

Messina, March 30.

G. B. RIZZO.

#### FROM THE NIGER TO THE NILE ACROSS AFRICA.<sup>1</sup>

DR. KARL KUMM (whom, from the indirect statements made in his book, we take to be of Swiss origin, and who now seems to be for all practical purposes an Englishman) assisted to found the Sudan United Mission in 1907-8. This mission was expressly intended to work in the Nigerian and Egyptian Sudan to counteract the Moslem advance, and Christianise the pagan tribes of negroes not as yet influenced by the Muhammadan religion. His previous acquaintance with Africa (according to the statements made in his "exordium") has been considerable. In 1899 he had visited "the southern oases of the Libyan Desert," and had travelled a considerable distance on the way to Darfur. In 1901 he travelled in Nubia. In 1904 he journeyed from Tripoli southwards into the mountainous region north of Fezzan and studied the Hausa language. In 1904-5 he led an expedition of investigation into northern Nigeria. In the two following years he visited America and South Africa to arouse interest in his mission and secure data as to the advance of Islam in the direction of the Zambezi. On his return from South Africa he visited Portuguese East Africa, Mombasa, and made a hasty journey to Uganda.

In October, 1908, he left Liverpool with seven missionaries of the newly formed Sudan United Mission to visit or to found mission stations in northern Nigeria, and establish a home for freed slaves. He further intended, if practicable, to cross Africa along the border-line between Islam and paganism.

The book under review is the result of this last journey, which extended from Forcados, at the mouth of the Niger, along the course of the Benue to the Musgu country on the Shari, thence up the Shari River to Fort Archambault, and from that point along the line of water-parting (more or less) between the Shari, the Congo, and the Nile. He emerged into some-

<sup>1</sup> "From Hausaland to Egypt, through the Sudan." By Dr. H. Karl W. Kumm. Pp. xiv+324. (London: Constable and Co., Ltd., 1910.) Price 16s. net.

thing like civilisation at Shambi, on the White Nile, midway between Lado and Fashoda. From Lado he descended the White Nile to Khartum, and thence journeyed home through Egypt. From the point of view of travel and endurance, it was the latest and not the least noticeable crossing of Africa; though to the thinking of the present reviewer, one of the most remarkable achievements in crossing Africa was that



FIG. 1.—A Sara-Kabba woman carrying a plate in her lips. From "From Hausaland to Egypt."

accomplished by Mr. Walter Savage Landor a few years ago. This last-named traveller, in ordinary clothes and an ordinary hat and boots, armed with a walking-stick, and attended by one or two faithful Somalis (as a nucleus), quietly walked the greater part of the way across Africa at its very broadest, from east to west, from Somaliland to Senegambia. Mr. Landor would seem to have been somewhat shabbily treated by the geographical societies of the world in the relatively slight recognition which followed his feat. Apparently the reason for this is the same cause as that of the somewhat unkindly reviews of Dr. Karl Kumm's book, which have recently appeared in one or two journals, namely, that the mere traversing of Africa on foot, or by any other means of progression available, counts for very little unless such a journey is accompanied by the gathering of new and important information regarding the geology, geography, zoology, botany, or anthropology of the country traversed.

No doubt there is some excuse for this point of view. But without reopening for the moment the question of Mr. Landor, the disparagement of Dr. Kumm's book seems a little harsh. *La plus belle fille ne peut donner que ce qu'elle a*. Dr. Kumm, perhaps, is most noteworthy (from the point of view of a biologist) as a collector of butterflies and moths. He managed to bring home 250 specimens of Lepidoptera, which have been named at the British Museum, and these are illustrated in the work under review by a selection of noteworthy forms very beautifully produced in colour, apparently by photography. So far as can be gathered from the book, none of these forms is completely new to science, but not a few of them are new as objects of wonder or beauty to the average reader.

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A little further information is given regarding the zoology of these southern Sudan regions. A pair of horns of the variety of the Cape buffalo, found in the Shari valley and Lake Chad regions, illustrates the local Chad race of buffalo, known to us, however, since the early part of the nineteenth century. Dr. Kumm mentions that the young buffaloes of this variety are red in the colour of their hair, but become perfectly black when full grown. From the Shari valley he brought back the portion of the skull of a giraffe, showing in the two principal ossicones the beginnings of an embranchment, a most interesting feature as evidencing the latent tendency in this group (with which, perhaps, the Pronghorn is very distantly allied) which led in Miocene times to such results as the extraordinary branched antlers of the Sivatherium. This same Shari giraffe exhibited an exceptional development of the ossicone on the nasal bones between the eyes. Instead of being a mere bump, it rises to a considerable knob with an attenuated stem. Dr. Kumm also shot a rhinoceros in the Shari valley, an interesting fact as serving with other scanty information to show that the range of the rhinoceros does extend across west Central Africa to western Nigeria. Until recently, no proof had been advanced to show that the rhinoceros (unlike the zebra) was found west of the White Nile; though there is, of course, the tradition that the Romans, in their abortive expedition to Lake Chad about the

year 21 A.D., entered a region on the outskirts of the Sahara Desert which swarmed with "unicorns." Dr. Kumm also thinks that he has discovered a new species or variety of crocodile, in which the bluish-black markings on the scales (present in the Nile and Slender-nosed crocodiles) have an exaggerated development, and form regular, blackish, vertical bands round the body. But this discovery is only an assertion backed up by a sketch from memory.

In Appendix A, Dr. Kumm gives some proverbs from the Beri-beri language, but we are not told (so far as I can gather) what is the geographical location of this speech. He supplies, further, a vocabulary of Bagirmi words, which, in view of Barth's admirable study of that language, is not a striking novelty. His vocabulary of Sara is more useful, though

that speech of the very heart of Africa has already been illustrated by the French. Quite new, or at any rate, very nearly so, are his vocabularies of Nilim and Korbai of the Shari region. He also gives a few words of Sango, a language of the Upper Mubangi. The photographs illustrating the book are for the



FIG. 2.—Horns of Shari-Chad Giraffe. From "From Hausaland to Egypt."



most part of only tolerable interest and appositeness; the drawings which supplement the photographs are exceedingly bad: one wonders that the publishers could have inserted such. Amongst the more interesting illustrations is that of a Sara-Kabba woman, with her lips expanded artificially into something like a duck's beak. This method of deforming the lips seems to be a very old one amongst the negro race, and to have existed in ancient times in the westernmost parts of Nigeria. From the very heart of Africa, where Dr. Kumm came across it, it extends sporadically to the region between the Albert Nyanza and the Upper Congo; then, after another long gap in distance, reappears in parts of German East Africa, and attains a notable development (described by Living-

#### THE NAGAS OF MANIPUR.<sup>1</sup>

THE monograph before us, descriptive of the Nāgas (included in the Tibeto-Burman group of races), is issued by the Government, Eastern Bengal, as one of the series which already includes volumes on the Khasis, Meitheids, Mikirs, and Garos. Mr. Hodson's survey extends only to the branch of the tribe settled in Manipur, numbering about 100,000 out of a total population of 162,000 in British India.

As regards social organisation, the clan, an aggregation of households, forms the permanent political unit. the tribe being only a group of clans with little or no solidarity. The only tribal bond appears in the enforcement of common taboos of food and seclusion, and in the rule that a man must not marry a woman



Photo.

Mao Nāgas. From "The Naga Tribes of Manipur.

E. J. Mitchell.

stone) in the regions between Lake Nyasa and the coast.

Dr. Kumm gives a chapter on the anthropology of the Sudan tribes, which contains some new information, and especially some interesting illustrations of the many different methods of skin mutilation on the face (cicatrization). He writes, however, much too freely about "Bantu," ascribing to the Bantu group of African people many tribes which have absolutely nothing to do with that language family. Although the conventional "Bantu" physical type is associated mostly with peoples of the Upper Congo of the lake regions and of South Africa who happen to speak Bantu languages, it is also to be met with elsewhere in West and Central Africa amongst tribes quite outside the Bantu language field. It short, it is better to drop the use of the term for any other but linguistic classifications.

H. H. JOHNSTON.

whose speech differs from his own. This is due to the inhospitable character of the land and to the ferocity of its inhabitants, facts which also affect the linguistics. As Dr. Grierson has shown, this type of monosyllabic language, possessing no literature, with a floating pronunciation, and a number of loosely used prefixes and suffixes, being necessarily subject to rapid change, emigrants settled at a comparatively short distance develop a dialect unintelligible to members of the parent village. This absence of tribal organisation adds greatly to the difficulty of bringing these wild highlanders under control.

The Nāgas combine with a fairly advanced material culture many barbaric practices. While part of their farming is on the Jhum system, that is to say, the periodical burning of patches of jungle and sowing the seed in the ashes, they also possess terraced fields

<sup>1</sup> "The Nāga Tribes of Manipur." By T. C. Hodson. Pp. xiii+212. (London: Macmillan and Co., Ltd. 1911.) Price 8s. 6d. net.